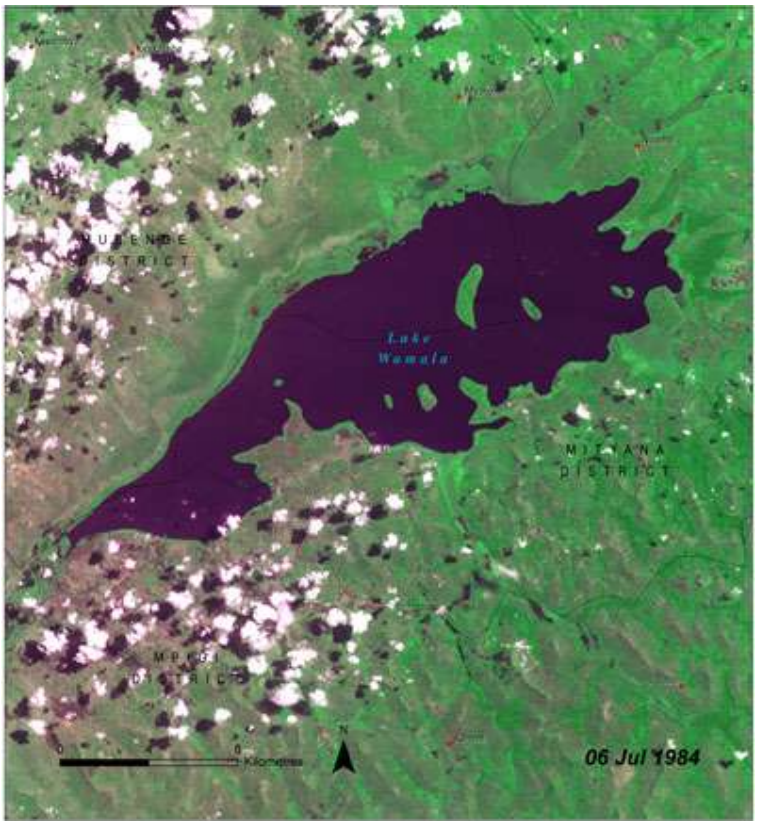
REPORT OF LAKE WAMALA FISHERIES FRAME SURVEY 2012



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Abstract

Lake Wamala, a small lake (180 km^2) located in Central Uganda and believed to have been part of the main Lake Victoria and only got separated about 4000 years ago, has already undergone different levels of fisheries evolution that warrant using it as a case study to inform changes in other systems. Using resources provided by the Lake Victoria Environmental Management Project (LVEMP) II, under the Applied Research Facility, we evaluated the fishing inputs, socio-economic infrastructure and analyzed trends in fishery benefits to guide evolution of management advice.

A frame survey was conducted on the entire lake (13^{th} - 23^{rd} March 2012) enumerating all fishing factors and enlisting available and accessible socio-economic infrastructure along the shores of the lake. The lake traverses districts (Gomba, Mityana, and Mubende) with its largest portion lying in Mityana. There are 26 established fish landing sites and about 600 fishers with a similar number of boats on the lake. The total number of boats on the lake is almost equal to the number of fishers; illustrating the common type (paracute) and size (Small, about 4 m) of boats and hence a fishing crew structure of one fisher per boat. Main fishing gears are Gillnets targeting the tilapia (Ngege) and long line hooks (*Protperus*, Mamba, and *Clarias*, Male). Almost equal number of boats used the two main gears on the lake (about 300 each). 97% of the gill nets on the lake are small (3.5" (8.9 cm – 4.5" – 11.4 cm) stretched mesh size while 98% of the hoots are large (< size 10). The implication is gill net fishers target small tilapia while long line fishers aim at the large mamba and male.

Generally the lake has poor socio-economic infrastructure compared to other lakes of Uganda probably due to its geo-morphological setting. The lakes fishing factors have continued to expand with the ever increasing population. There may be need to check the continued entry into the fisheries especially if the increasing effort does not translate into increase in fishery yield.

INTRODUCTION

Lake Wamala is one of the significant small lakes in Uganda after the five large lakes Victoria, Albert, Kyoga, Edward and George. The lake is located in central Uganda northwest of Lake Victoria and generally surrounded by numerous swamps and marginal vegetation and mashes. The lake lies between latitudes 0^o 15'; and 0^o 25' N 31^o 45' to longitude 32^o 00' E, longitude and at an altitude of 1000m above sea level. It varies in size both seasonally and over a long-term drought cycle, with a periodicity of up to 30 years. Lake levels were very low in early 1990's but with El Nino rains of 1997, there has been significant improvement in the size of the lake and overall fish catches. It is indicated that the surface varies from 100 to 180 sq. km depeding on the season.

There are 6 rivers feeding this lake i.e Rivers Bimbya, Mpamujugu, Nyonzi, Kobusuma, Kibimba and Nabokazi. (Kaddumukasa *et al.* 2006). Following heavy rains in 1961 the open water of the lake expanded from about 100 km^2 to 118 .km^2 while the fringing swamps and islands covered about 60 km^2. It maximum depth was 4.3 metres (Okaranon 1995). In the 1980's this lake prevously was found in Mubende district and had 11 landing sites i.e Gombe, Katiko, Bukongo, Buteba, Karyonkoko, Kamuli, Luboja, Buzibazi, Lusalira, Mamba and Lunoni. An aerieal count in october 1965 gave 450 canoes on the lake and up to 53 canoes were recorded in Katioko landig site alone (Okaronon 1993).Today the situation has changed the number of landings have increased due to population expansion around the lake.The communities around the lake purely depend on the system for their livelihood and poverty reduction in particular fishing besides livestock and crop production.

Unlike other major water bodies of Uganda where period assessment of fishing factors is carried out to guide managemnt, fishing effort and infrastructure on Lake Wamala have not been evaluated or reported for close to two decades. It was reported that one of the management problems of most African lake fisheries is that they are open access with no control of fishing effort (FIRRI, 2002). Poor management on any lake is partly attributed

to lack of or inaccessibility of information on the types and size structure of fish available for harvesting, guidelines on the quantities of fish that can be harvested without depleting the stocks, suitable fishing effort and fishing gears and methods for exploiting the fisheries. Although Lake Wamala is an important system that supplies fisheries resources and significantly contributes to the economies of the riparian districts, a regular assessment of its fisheries has elluded managemnt.

Aganaist the above background, the intervestion provided by the Lake Victoria Environmental Management Project II, under the applied Research provided an invaluable opportunity to assess and report on the status of one of the sattelite lakes of the eco-region.

OBJECTIVES

The overall objective of the frame survey conducted on Lake Wamala was to make a systematic assessment of the magnitude and changes in the fishing fleet, infrastructure development and evaluate the socio-economic interphase of the lake and its surroundings. We specifically evaluated and generated:

- The level of fishing effort on the lake in comparison to the previous estimates
- The facilities related to the fishing industry available at all the fish landing sites on the lake.
- Useful information on the fishery structure of the Lake Wamala system that can be used to guide its management.

METHODOLOGY

A systematic sampling design was adopted to cover the whole lake in a specified period. Under this design, Scientists from the National Fisheries Resources Research Institute (NaFIRRI) in collaboration with Staff from the Department of Fisheries Resources (DFR), District fisheries officers and some members of the Beach Management Units (BMUs) traversed all the landing sites and enumerated fishing factors and available

fisheries and socio-economic facilities such as fish processing industries, Schools and hospitals, fish markets etc. Given the terrain and swampy nature of the lake, most of the landing sites were accessed through water by canoes.

Unlike, a BMU based Frame survey as provided for in the Standard Operating Procedures (SOPs) on Lake Victoria and other major lakes of Uganda, the sampling design used on Lake Wamala was similar to the one used on Lake Albert 2007. Under this system, the trained officers from research, management and districts conduct the enumeration themselves at all landing sites in the district under each team's jurisdiction. This system has the advantage of keeping consistence in data collection protocols that are important in as system like Lake Wamala which has not had routine surveys sensitizing the BMUs.

Preparatory activities involved forming a committee to come up with budgets and work plans to the survey. The team was led by Dr. Ogutu-Ohwayo Richard as the principal investigator of the study. Preparatory meeting were held through which team members were sensitized on the approach to ensure consistence.

Data Capture

The frame survey exercise was conducted from 13th - 23rd March 2012. A harmonised questionnaire was used to capture comparable data (Appendix I). Data capture forms were designed (Appendix II) and studied during the preparatory meetings. The survey approach was both a typical census where all the main facilities used by fishermen including the personnel were registered through interviewing the boat owners, crew and BMU leaders and physical measurements in addition to extrapolation based on collected local knowledge.

Data Processing

Data entry and analysis was done by the NaFIRRI team. All the data was entered in excel spread sheet and analysis was done using pivot table summarization in excel. Comparisons were made with previous sporadic surveys to generate trend analysis.

Figures and table were used to illustrate trends on proportions of gears from different districts.

RESULTS

Fish landing sites and boats

A total of 26 fishing landing sites were recorded on Lake Wamala, 16 of them (60%) in Mityana district with 2/3 of the total number of fishing boats on the lake. The other two districts (Gomba and Mubende) have five landing sites each with comparable number of boats (Table 1).

Table 1. Showing the landing sites covered during the frame survey on Lake Wamala March 2012

District	Landing site	No of fishing boats	Total no of fishing boats
Mityana	Buzibazi	19	408
	Mawanga	22	
	Kyandalo	23	
	Katiko	28	
	Lubaja B.	26	
	Lubaja A.	23	
	Karyankoko	19	
	Kimuli	13	
	Butebi	40	
	Nkonya	37	
	Bukanaga	16	
	Gombe	33	
	Lusarila	72	
	Kalitunsi	16	
	Lwanju (Island)	11	
	Lwakalonge	10	
Gomba	Mamba	31	103
	Maseregenya	16	
	Lukunyu	15	
	Lunoni	26	
	Nabuyindo	15	
Mubende	Bugolo	43	103
	Bagwe	14	
	Kyayi	13	
	Wamala	11	
	Kampanzi	22	

The 26 landing sites on the lake are scattered all over the whole coastline that has diverse swamps and marginal vegetation, some few landing sites are located on both Bagwe and Lwanju Islands in the central part of the lake Fig 1. GIS map of the lake (Fig.1) shows most landing sites are some distance from the open water, a common characteristic of swampy shore.

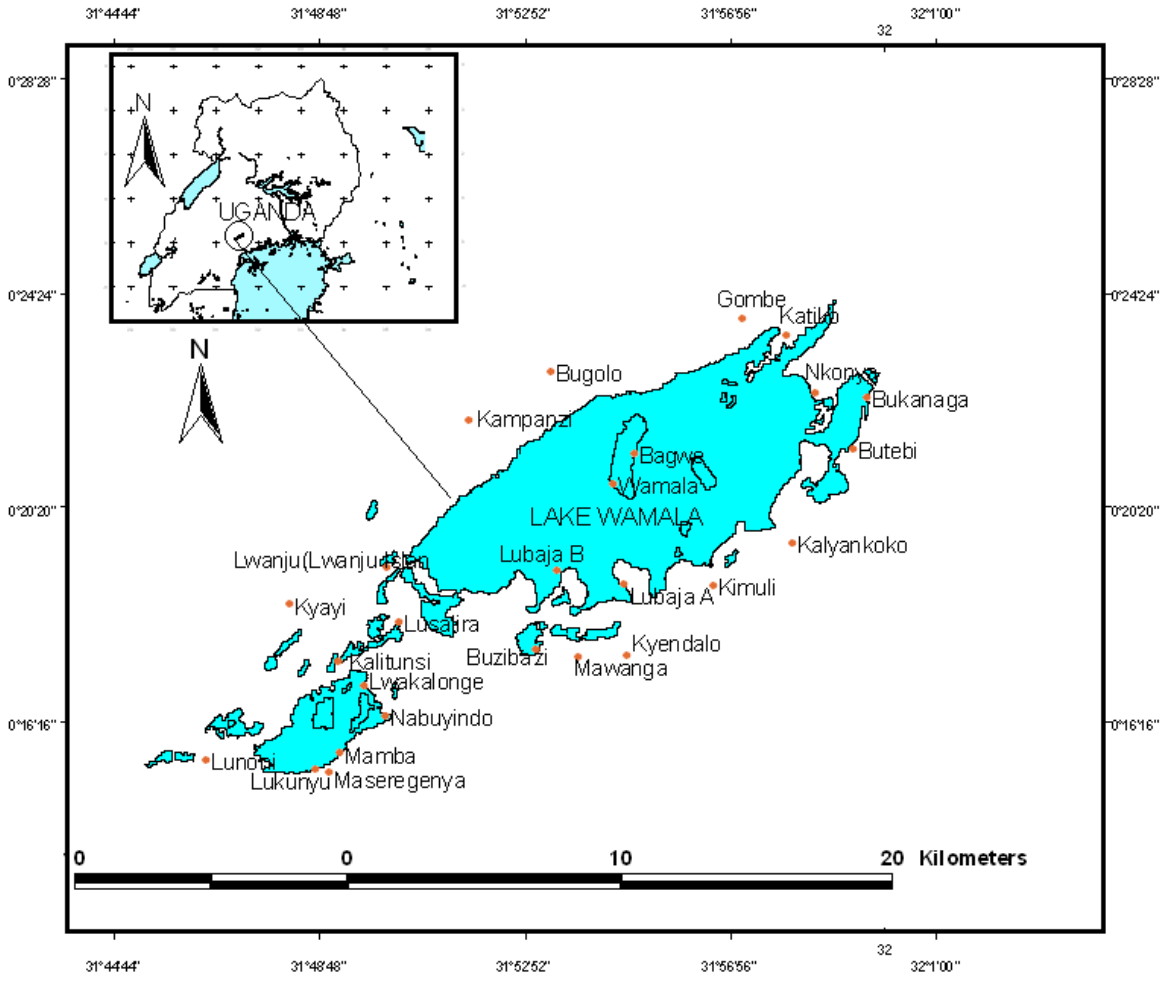

Figure 1: Geo-referenced map of Lake Wamala showing the current landing sites distributed along the shore line and on islands Inset: Location of Lake Wamala in Uganda

Facilities at the landing Sites

Facilities observed included bandas/sheds, cold rooms, pontoon/jetties, fish stores and net repair facilities, all weather roads and electricity supply. Nearly half of all the landings had accessible weather roads (Table 2). Unlike other major lakes in the country where improved facilities such as bandas (fish selling sheds) and jetties are common, only one fish landing site on Lake Wamala had a banda. Only 8 landing sites had portable water facilities and BMU offices at the landing sites.

Number of fishers on the lake

The total number of active fishers on Lake Wamala was 600. Out of these 400 (60%) were recorded in Mityana district, 100 (20%) in Gomba, and another 100 (20%) in Mubende (Table 2). Just like other water bodies in the country characterised by open access fisheries, the numbers of fishers on Lake Wamala has continuously increased. Mityana district which has the largest portion of the lake, the highest number of landing sites has the highest number of fishers.

Fishing Crafts and mode of propulsion

The total number of fishing crafts operating in the lake was 614 and all were of parachute in type and propelled by paddles. In Gomba they had 103 (16.8%), Mityana had 408 (66.4%) and Mubende 103 (16.8%). All the fishing boats on Lake Wamala were operated by paddles. The only recorded motorised boat was a Sesse pointed one end transport boat at Lubaja A using outboard engine. Most of them had on crew member.

Fishing gears

Fishing gears mostly in use includes gillnets of varying mesh sizes, longline and hand line. The total number of gillnets were 4800 and out of these 1300 in Gomba, 3200 in

Mityana and 300 in Mubende. In the entire lake the most dominant nets sizes used were 3.5", 4" and 4". Less than 100 net of mesh size ≥ 5" (legal mesh size on large lakes of Uganda) were recorded on Lake Wamala.

A total of 96,300 long line hooks were recorded on Lake Wamala, 10,600 were found in Gomba, 58,400 in Mityana and 15,600 in Mubende. Hand lines were found in Mubende district only with total number of 422 (Table 2).

Transport Boats

There were a total of 18 transport boats on the entire lake and 10 from Mityana then 8 from Mubende district. Gomba district registered none.

Derelict Boats

We registered 58 derelict (irreparable) boats and 23 from Gomba, 26 in Mityna and 6 in Mubende district. The derelict boats were 9.45% of the entire total fishing boats. This could represent loss of income to the owners or boats owners who are not in position to cause fast repairs.

Table 2. Summary of the Lake Wamala Fisheries Frame Survey, March 2012

ITEM		**DISTRICTS**			
		GOMBA	**MITYANA**	**MUBENDE**	**TOTAL**
LANDINGS	Number of landing sites	5	16	5	26
FACILITIES	Bandas	1			
	Cold Rooms				
	Pontoon/Jetty				
	Fish Stores				
	All Weather roads	1	10	2	13
	Boat Repair Facilties		4		4
	Electricity Supply				
	Potable water facility		6	2	8

	Net repair facility		2		2	
	BMU offices at the landings	2	6		8	
FISHERIES STAFF	Fisheries Staff	1	1	2	4	
FISHERMEN	Number of fishermen	103	408	105	616	
FISHING CRAFTS	Number of fishing vessels	103	408	103	614	
PROPULSION	Number of outboard engines					
	Number of inboard engines					
	No. of boats with paddles	103	408	103	614	
	No. of boats with sails					
GEARS	Gear type &size					
	Gillnets	< 2½"		60		60
		2½"				
		3"		13	56	13
		3½"	918	196	186	1170
		4"	388	1899	65	2473
		4½"		969	15	1034
		5"		63		78
		5½"		10		10
	Total gill nets		**1306**	**3210**	**322**	**4838**
	Number of Long line hooks	<4			11581	11581
		4-7	8660	5810	4050	26051
		8-10	2000	51425		57475
		>10		1200		1200
	Total long line hooks		**10660**	**58435**	**15631**	**96307**
	Number of handline hooks				422	422
	Total of hand line hooks				**422**	**422**
TRANSPORT BOATS	Transport boats		0	10	8	18
DERELICT BOATS	Derelict boats		23	26	9	58

DISCUSSION

Socio-economic facilities such as markets, schools, hospitals and general infrastructure developments such as roads, social amenities (e.g. electricity), commercial buildings and offices are important signs of a developing society/system. Our results indicate the infrastructure development on Lake Wamala still remain poor. Only half of the landings have all weather roads, only 30% of the landings had a BMU office, similar proportion had clean water and above all none of the landings has electricity supply. The geographical setting of Lake Wamala is to a large extent responsible for the poor state of infrastructural development. The Lake is surrounded by swamps that make it difficult to establish proper landing sites and have proper all weather roads. It is generally remote from large and modernised centres such as Mityana and Mubende such that the spill over effect of development is rarely felt.

In Uganda, the development of fisheries infrastructure has moved with the evolution of the diverse fisheries and levels of their stocks. The first fish processing plant to be established in Uganda was TAFMAC on Lake George targeting the then abundant tilapia stocks of the lake. Subsequent developments in the sector have come with the Nile perch boom. Developments of numerous fishing processing plants, cold rooms, bandas and big markets and landing sites as seen on major lakes of the country (Victoria, Kyoga and Albert) have followed the Nile perch fishery. Unfortunately, Lake Wamala has no Nile perch and has remained dependant on the tilapia (Ngege), *Clarias* (Male) and *Protopterus* (Mamba). These fishes are mostly transported fresh or smoked/sun dried and sold to distant markets. The revenue accruing from them therefore develops distant places which are far removed from the landings compared a situation where facilities for their processing were established near the lake.

Being a shallow lake with numerous floating islands (Sudds), Lake Wamala fishers are highly migratory. Changes in numbers of fishers landing at given landing sites on the lake sometimes on daily or periodic basis interferes with the incomes recorded at the landing sites. This translates into unpredictable resources for development goals at the landings hence a major impediment to development planning. Just like the fishers even

fish mongers on Lake Wamala are always shifting from landing to landing as result of constant blockages of the landing sites by sudds.

Fishing on most of the African lakes just like other third world fisheries have remained largely open access. Similarly, the fishing effort on Lake Wamala Just like other Ugandan lakes has been increasing steadily over the years especially during the time when the water levels increased in this water body. Lake Wamala's original fish fauna was dominated by Mamba, Male and haplochromines (Nkejje). The early fishing technologies in the lake targeting the three fish species were artisanal and largely primitive. Along rivers and river mouths, fishing was conducted using indigenous gears such as basket traps, hooks, spears, and seine nets of papyrus or reeds (Okaronon, 1975). The fishery at that time provided employment opportunities for fishers, fish distributors and administrators (MNR, 1994). At this period the population around the shores was still low and generally people entering the fishery were few. In addition, Tilapiines were absent in the lake until 1956, when three Tilapia species: *Oreochromis niloticus*, *Oreochromis leucostictus* and *Tilapia zilli* were introduced to boost its productivity (Ogutu-Ohwayo, 1990). The Tilapiines established themselves very quickly and the lake was opened to commercial fishing under controlled exploitation in 1960. What was supposed to be controlled fishing quickly translated into an ever increasing level of fishing effort. At the time when commercial fishing was re-opened in Lake Wamala in 1960, only 250 boats, each using 10 gill nets of five-inch (127mm) mesh size or 100 hooks fishing passively were permitted to fish in the lake. The limit of the number of fishing boats was not adhered to and fishing effort continued to increase as more boats entered the fishery along with increase in human population. By 1967, approximately 1000 boats were operating in the lake and gill nets of 5''(127 mm), 4.5"(114 mm), 4''(102 mm), and 3.5''(89 mm) mesh size were in common use, decreasing further to 2"(51mm) by 1988/92 (UFD, 1965; Okaronon, 1987; 1995). The current Frame survey has shown that the large sized nets 5" are now very rare on the lake. This factor can be attributed to the stunting of the fish following reduced exploitation during the period of political instability in the 1970s and 80s and receding of the water level prior to the 1997

El Nino rains. At this period, the open access fisheries on the lake collapsed due to over fishing and drought (Okaronon, 1987).

Conclusion and Recommendations

The fisheries structure of Lake Wamala is generally primitive, highly artisanal with no single motorised boat. The effort remains one-boat-one-crew but more commercial oriented than home consumption. It is therefore one of the easiest forms of fishery to institute specific management measures and monitor. There is therefore need to institute specific management measures that can be emulated elsewhere. Otherwise, with such a primitive structure it is very difficult to plan and improve infrastructure and service delivery.

Based on the above observation we suggest that:

- Species specific licensing be instituted and boats and crew clearly registered for specific target species that will ultimately determine the gears they use.
- Controlled entry into the fishery as has been tried in conserved areas like Lake George and Murchison falls National Park.
- Periodic taking of Frame survey data (e.g every 2 – 4 years) will help establish changes in fishing effort and appropriate management measures studied and instituted.
- A follow up of catch trends should be done to assess the relationship between the changing fishery structure and fish yield. This could be done through use of BMU data collectors with constant ground trothing from the department of fisheries resources and research.
- Sensitisation of fishermen on the importance of Frame survey data capture and following catch trends need to be done on a regular basis to make fisheries accept their role in managing their fisheries.

Challenges during the survey

- In general the frame survey exercise was successfully conducted albeit challenges such as the moving sudds and consequent migratory nature of fishers. We were able to cover all the landing sites on the whole of Lake Wamala despite the fact the sudds at certain period of time could not allow teams to finish in time. In some few landing sites we had to link up with the BMU Chairmen and their people to come near the entrance of the landing in order to assess them from there where our boat could not reach at such landings. We also experienced problems of outboard engine damage that resulted into use of borrowed engines that were of high power and fuel consumption.

ACKNOWLEDGEMENTS

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Appendices

Appendix 1. Harmonised quetionnaire

Annex 2 FRAME SURVEY RECORDING FORM

PART A: DOCUMENT IDENTIFICATION AND LOCATION DETAILS

NAME OF ENUMERATOR	
STATUS/ RANK OF RESPONDENT	
DATE	
COUNTRY	
DISTRICT	
SUB-COUNTY/ DIVISION	
LOCATION/ PARISH/WARD	
NAME OF LANDING SITE	
POSITION (Latitude and Longitude)	

PART B SUMMARY OF NUMBER OF VESSELS AT LANDING SITE

VESSEL CATEGORY	NUMBER
OPERATIONAL FISHING VESSELS	
DERELICT VESSELS (NON-OPERATIONAL)	
TRANSPORT VESSEL (FOR FISH)	
TRANSPORT VESSEL (OTHER PURPOSE)	

PART C LANDING SITE FACILITIES

1 BANDA [1] YES [2] NO
2 COLD ROOM [1] WORKING [2] NOT-WORKING
[3] NONE
17. PONTOON/JETTY [1] YES [2] NO
18. FISH STORE [1] YES [2] NO
19. ELECTRICITY SUPPLY [1] YES [2] NO
20. IF "NO" HOW FAR TO NEAREST SUPPLY (KM)?
[1] <1 [2] 1-5 [3] 6 - 10 [4] > 10
21. TOILET FACILITY [1] YES [2] NO
22. POTABLE WATER [1] YES [2] NO
23. IS BEACH ACCESSIBLE BY ALL WEATHER ROAD? [1] YES [2] NO
24. IF "NO" HOW FAR TO NEAREST ALL WEATHER ROAD (KM)
[1] <1 [2] 1-5 [3] 6 - 10 [4] > 10

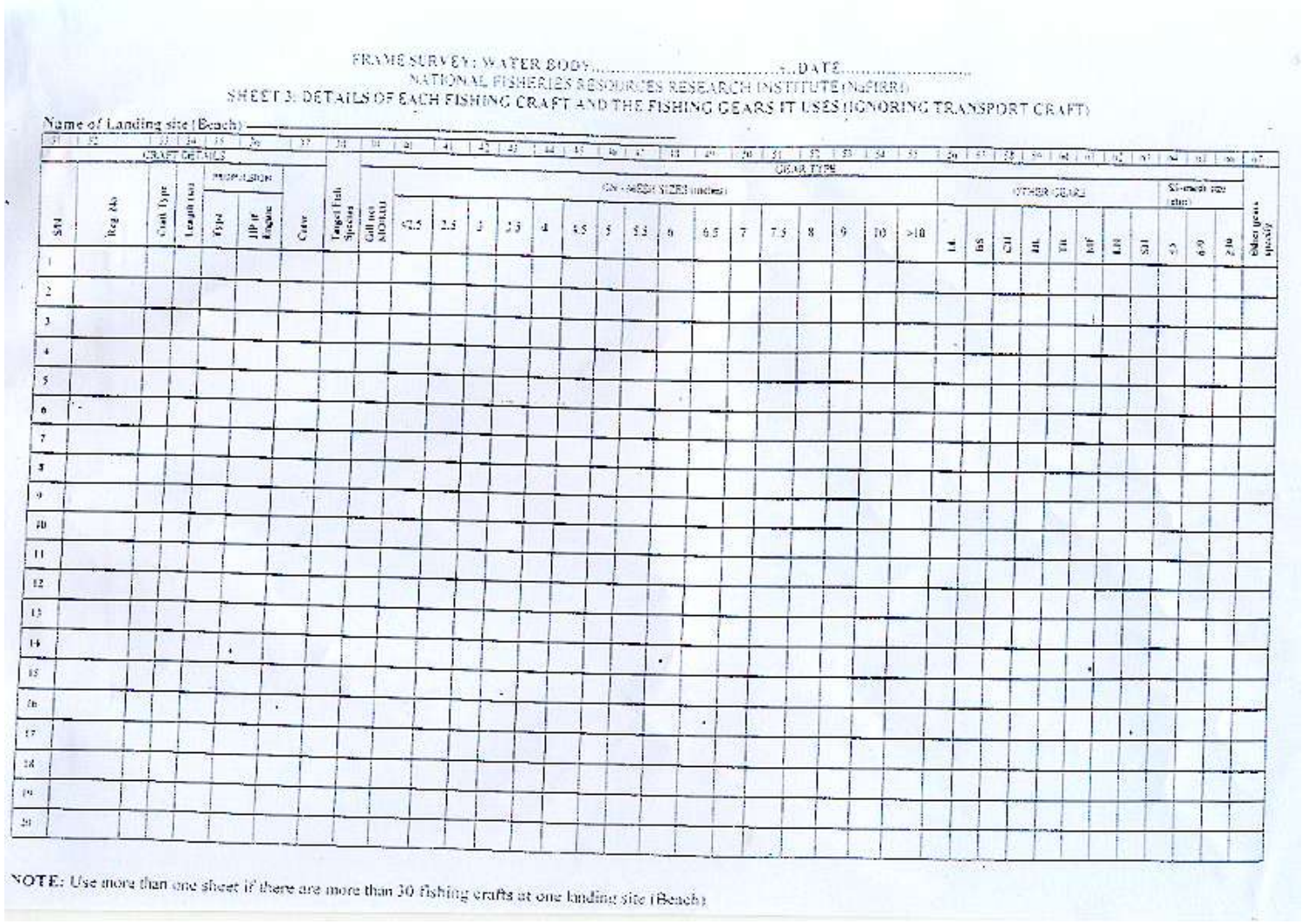
25. DESIGNATED NET REPAIR FACILITY [1] YES [2] NO
26. DESIGNATED BOAT REPAIR FACILITY [1] YES [2] NO

27. IS FISHERIES STAFF RESIDENT? [1] YES [2] NO
28. IS THE BMU BASED AT LANDING BEACH? [1] YES [2] NO

29 NAME THE NEAREST MARKET (WHERE MOST OF THE FISH IS FIRST SOLD)
.....

30 DO FISHERMEN LAND AT THIS BEACH FOR
[1] > 5 MONTHS OF THE YEAR
[2] < 5 MONTHS OF THE YEAR

Appendix 2. Data capture forms.



FRAME SURVEY: WATER BODY:.....DATE.....

NATIONAL FISHERIES RESOURCES RESEARCH INSTITUTE (NaFIRRI)

SHEET 3: DETAILS OF EACH FISHING CRAFT AND THE FISHING GEARS IT USES (IGNORING TRANSPORT CRAFT)

Name of Landing site (Beach):.....

	CRAFT DETAILS							GEAR TYPE																																
				PROPULSION				GN (=NET) SIZES (inches)														OTHER GEARS										SG (=mesh size) (cm)								
S/N	Reg. No	Craft Type	Length (m)	Type	HP if Engine	Color	Target Fish Species	Gill net MONO/MULTI	<2.5	2.5	3	3.5	4	4.5	5	5.5	6	6.5	7	7.5	8	9	10	>10	LA	GS	CH	BL	TR	MF	BR	SH	<5	6-9	≥10	Other gears specify
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NOTE: Use more than one sheet if there are more than 30 fishing crafts at one landing site (Beach)